# Zero-revenue IPOs

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**Abstract**

Information-based models of the IPO decision suggest that going public before having generated revenues is inefficient. Still, 15% of firms going public in Europe have not reported revenues prior to the IPO. The paper investigates why these firms decide to conduct an IPO and examines whether the absence of revenues affects the outcomes of this decision. The evidence shows that zero-revenue firms go public to fund investments, mainly in the form of R&D. However, their shares are more underpriced at the IPO and develop less liquid and more volatile aftermarket trading than those of revenue-generating issuers. These effects are driven by firms whose revenue-less status is more persistent, as 19% still report no revenues at the three-year IPO anniversary. Also, zero-revenue issuers face a higher risk of being delisted shortly after the IPO. Overall, the evidence indicates that zero-revenue firms go public in an attempt to fund superior growth opportunities, but the high levels of information asymmetry and uncertainty increase the cost of raising capital and the risk of delisting.

**JEL classification**: G32, G33, G34

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## 1. Introduction

Over the last decade, 15% of companies going public in Europe had no revenues at the time of the IPO. A firm's decision to issue public equity even before bringing its products to the market is somehow puzzling. Information-based models of the IPO decision predict that firms should go public only after a sufficient amount of information about them has accumulated among potential investors (Chemmanur and Fulghieri, 1999). In the same vein, product market-based models indicate that firms should first finance projects with the greatest revenue-generating ability privately, and then rely on public markets only to fund remaining investment opportunities that contribute to incremental growth (Spiegel and Tookes, 2008). Most of the empirical evidence is consistent with the above theoretical predictions, as a private firm's likelihood of going public becomes significant only after reaching some critical size and productivity levels (Pagano et al., 1998; Chemmanur et al., 2010). This implies that going public in absence of revenues may be an inefficient decision. Still, zero-revenue firms across Europe have succeeded in raising around 9 billion euros over the last decade. This paper sheds light on the reasons pushing these firms to conduct an IPO, and investigates whether the absence of revenues affects the outcomes of this decision.

The trade-off faced by a zero-revenue firm evaluating the option to go public can be modeled as follows. On one hand, the absence of revenues implies larger costs of information acquisition for outsiders, with investors possibly requiring an extra compensation to participate in the offering, e.g. in the form of underpricing. Therefore, a premature IPO timing may result in increased costs of raising capital for the firm. On the other hand, the IPO allows to gain greater flexibility in accessing financial resources and unlock value-enhancing projects thanks to the fresh infusion of cash. The young age and the absence of revenues imply that the value of these firms is almost exclusively ascribed to growth opportunities. These opportunities are likely to be missed if the firm remains private, because the lack of an established stream of revenues that can serve as collateral to new debt issuance further exacerbates financial constraints, typically more severe for private rather than public firms in the first

place. Thus, if the expected benefits from pursuing such growth opportunities offset the expected costs of raising capital in presence of increased information asymmetry, then zero-revenue firms may find it optimal to go public.

The first objective of this paper is to identify the reasons why a firm decides to go public despite its inability to generate revenues until then. Since cashing out by existing shareholders and capital structure rebalancing are unlikely to be relevant motives due to the young age and low leverage of these firms, the analysis focuses on two factors, namely investments and M&A activity. The growth opportunities explanation predicts that, in equilibrium, zero-revenue firms that decide to go public invest more than their revenue-generating peers after the IPO as they face superior growth opportunities that are expected to offset the larger information production costs. These opportunities may consist of internal and external growth, as IPO proceeds can be allocated to investments and stocks can be used as acquisition currency. Furthermore, as being acquired by an established incumbent is increasingly modeled as a successful outcome for new entrants (Gao et al., 2013), it is possible that zero-revenue firms go public in an attempt to gain visibility and draw the attention of potential acquirers.

The second objective of this paper is to assess whether the absence of revenues affects the outcomes of the going public decision in a way that may increase the cost of raising capital for the firm. The link between product and financial market characteristics generates important implications for investors who consider to participate in IPOs by zero-revenue firms. First, the inability to bring products to the market makes it hard for investors to be acquainted with the firm at the time it goes public, thereby increasing the level of information asymmetry. Second, uncertainty about whether and when the firm will manage to start generating revenues increases the risk associated with the investment. This predicts that zero-revenue firms are more underpriced than revenue-generating issuers at the IPO, as investor would require a compensation for their superior risk taking, and develop

less liquid and more volatile trading in the aftermarket. Also, this may expose zero-revenue IPOs to a higher risk of delisting.

The above predictions are tested on the population of 2,432 non-financial European IPOs during the period 2002-2014. Although it is unlikely that firms self-select into the zero-revenue status, their behavior is benchmarked against both the rest of the population of IPOs and a matched sample of revenue-generating issuers to alleviate possible endogeneity concerns. The choice of the European context is motivated by the presence of second-tier, loosely regulated markets, such as London's Alternative Investment Market (AIM), designed to facilitate small firms' access to public equity capital (Vismara et al., 2012). The minimal admission criteria set by these markets make it easier for firms with no revenues to go public, thereby increasing the relevance of the zero-revenue IPOs phenomenon. In terms of industry distribution, more than half of these issuers belong to the natural resources and pharmaceutical industries. This is consistent with prior literature documenting that firms operating in industries characterized by greater capital intensity tend to go public at an earlier stage of their life cycle (Chemmanur et al., 2010).

The empirical evidence can be summarized as follows. The analysis of IPO motivations documents that zero-revenue firms invest more in research and development (R&D) than both the rest of the population and the matched sample of revenue-generating issuers after going public. This result provides support to the growth opportunities explanation. On average, the R&D expenses to total assets ratio of zero-revenue firms computed across the three years post-IPO is 2.4 percentage points higher than that of other firms. At the same time, capital expenditure is 2.6 percentage points lower, and the likelihood of making an acquisition decreases by 11%. In line with the young age and industry distribution of these firms, the evidence suggests that their growth opportunities consist of early stage, innovation-oriented investments rather than increases in tangible fixed assets or acquisitions of other firms. Inspection of official IPO prospectuses supports this view. For instance, the intended use of proceeds stated by Circassia Pharmaceuticals, a UK-based biotech company gone

public in 2014 and focused on the development of immunotherapy products for allergies, was to bring its lead product candidate to market and advance the development of its other clinical-stage product candidates. As for the likelihood of being targeted in an M&A shortly after going public, the results show that it does not differ between zero-revenue and other issuers.

The evidence on IPO outcomes documents that the absence of revenues plays a negative role. First, zero-revenue IPOs are more underpriced than ordinary IPOs, with an average difference of 2.3 percentage points. This is consistent with the presence of increased information asymmetry that leads to a larger amount of money left on the table. Second, aftermarket trading is characterized by a significantly lower level of stock liquidity, with the evidence being robust across three different proxies, namely bid-ask spread, Amihud's (2002) illiquidity ratio, and the fraction of zero-return days. Also, zero-revenue stocks are more volatile, as the standard deviation of returns is 21% higher than that of the matched sample. Consistent with the view that a firm's inability to generate revenues increases information asymmetry and uncertainty among investors, the two above effects are primarily due to issuers whose revenue-less status lasts longer after the IPO. Indeed, a significant fraction of firms, namely 19%, still reports no revenues at the three-year IPO anniversary. Third, zero-revenue firms face a higher risk of delisting. The likelihood of being delisted within three years of going public is 3.8% higher than that of the matched sample.

The contribution of this paper is two-fold. First, it adds to the recent literature relating product market characteristics and IPO outcomes (see, e.g., Chemmanur and He, 2011). In particular, IPOs by loss-making firms have received a great deal of attention (e.g., Yi, 2001). The fraction of firms going public with negative earnings has increased over time, with a peak during the dot-com bubble (Ritter and Welch, 2002).[1] Aggarwal et al. (2009) document that firms with more negative earnings are perceived as facing greater growth opportunities and obtain higher valuations at the IPO. This paper takes another perspective as the absence of revenues conveys information about the issuers that

[1] See Jay Ritter's website for updated data on IPOs by companies with negative earnings.

are substantially different from those associated with negative earnings. While losses for the period may be due to the firm's temporary failure to cover its costs, the absence of revenues indicates its inability to bring products to the market to date. In the latter case, the implications for investors and other market participants are substantially different from those generated by a loss-making IPO firm that has already commercialized its products. Second, the paper adds to the debate on the success factors that help early-stage firms to raise capital. The role played by the presence of prior revenues (or 'traction') in attracting early-stage financing seems to depend on the type of capital suppliers, with professional investors such as venture capitalists (VCs) and business angels (Bernstein et al., 2017) responding differently from the crowd (Vismara, 2016). This paper contributes to this stream of literature by documenting that the absence of revenues leads to larger costs of raising public equity capital and to a higher risk of delisting, consistent with increased information asymmetry and uncertainty faced by investors.

The remainder of the paper is organized as follows. Section 2 reviews the related literature and formulates the hypotheses. Section 3 presents the sample, data, and methodology used in the paper, and shows some descriptive statistics. Section 4 presents the results of the multivariate analyses on IPO motivations and outcomes. Section 5 provides evidence of additional tests about natural resources industries and VC backing. Section 6 concludes.

## 2. Related literature and hypotheses

### *2.1 Zero-revenue status and IPO motivations*

This subsection reviews the related literature and formulates the testable hypotheses about the motivations behind a zero-revenue firm's decision to conduct an IPO. Since cashing out by existing owners and debt rebalancing are unlikely to play a role due to the young age and the low leverage of

these firms, the following two motives are discussed: (1) raising funds for investments, and (2) facilitating M&A activity.

### *2.1.1 Investments*

Access to capital aimed at funding growth opportunities is an important motivation for going public (Choe et al., 1993). Lowry (2003) documents that changes in private firms' demand for capital explain fluctuations in IPO volume. Information-based models of the IPO decision suggest that going public in absence of revenues may be an efficient choice only if the value-enhancing effect of unlocking superior growth opportunities is expected to offset information production costs, which are presumably larger for zero-revenue firms relative than for revenue-generating issuers. Financial constraints typically affecting private firms to a larger extent than public firms become even more severe in absence of an established track record. This may make the issuance of public equity the only option available not to forgo such growth opportunities. Thus, these firms' likelihood to survive after going public depends exclusively on their ability to turn these opportunities into positive NPV investments by efficiently allocating IPO proceeds. If the decision to go public serves this purpose, then we should expect larger post-IPO investments by zero-revenue firms relative to revenue-generating issuers.

The absence of revenues allows to draw implications also for the type of investment to which these firms are likely to allocate IPO proceeds. Indeed, investment strategies of small and young firms sensibly differ from those of large and established incumbents (Acs and Audretsch, 1988). In particular, established firms tend to be more concerned about gaining efficiency, minimizing risk, and safeguarding current assets as their stream of rents comes primarily from existing products. This lowers their incentive to undertake R&D investments that may result in their own products being cannibalized (Arrow, 1962). On the other hand, new entrants cannot rely on an established stream of revenues and are motivated by the advantage of becoming first movers. This leads to a division and specialization of the innovation effort, with small firms investing mostly in radical innovation, and

large firms engaging in incremental innovation. Zero-revenue firms, which have not yet succeeded in bringing their products to the market, are still at an early stage of their life cycle. This indicates that IPO proceeds are more likely to be allocated to radical rather than incremental innovation projects. Radical innovation is typically pursued by means of R&D investments, which measure a firm's commitment in terms of innovative input as opposed to patents, which instead proxy for innovative output (Signori and Vismara, 2014). Therefore, the investments undertaken by zero-revenue firms are more likely to have the form of R&D expenses aimed at generating breakthroughs rather than purchases of physical assets aimed at increasing productivity. This leads to the prediction that zero-revenue issuers invest more in R&D than revenue-generating issuers after going public.

*2.1.2 M&A activity*

Prior literature has documented that a firm's acquisition activity soars after going public (see, e.g., Celikyurt et al., 2010). The fresh infusion of cash, the creation of stock as alternative currency, and the reduction of uncertainty with respect to potential takeover gains are all benefits that tend to trigger acquisitions by newly listed firms (Hsieh et al., 2011). The growth opportunities explanation predicts that zero-revenue firms are more likely to conduct acquisitions than revenue-generating issuers after going public as long as external growth is part of these opportunities. Also, potential targets may be more likely to accept an acquisition bid made by a firm facing promising growth prospects (for a given bid and a given intrinsic value).

At the same time, however, an increasing fraction of firms is being acquired shortly after going public (Gao et al., 2013). Prior literature has highlighted the role of the IPO as an intermediate step towards the subsequent sale of the firm, given the benefits obtained in terms of reduced information asymmetry (Reuer and Shen, 2004), increased bargaining power (Zingales, 1995), and the possibility to invest IPO proceeds in value-enhancing projects that allow to subsequently sell the firm at a better valuation (Poulsen and Stegemoller, 2008). These effects should be particularly beneficial for zero-revenue firms, which suffer from more severe information asymmetry and financial constraints in

light of the above theoretical arguments. Furthermore, in line with the predictions on R&D investments, the fact that zero-revenue firms are more likely to conduct more radical innovation than large incumbents implicitly shapes their role in the market for corporate control (Henkel et al., 2015). Large and established firms, focused on harvesting innovation outputs, are indeed more likely to become acquirers, while small and young firms, still putting a great deal of effort in innovation inputs, tend to become targets (Bena and Li, 2014).

Overall, the predictions about the effect of the zero-revenue status on post-IPO M&A activity can be formulated as follows. First, zero-revenue firms' likelihood of making an acquisition is not expected to differ from that of other revenue-generating issuers because, although growth opportunities may unfold through acquisitions, the absence of revenues makes these firms less suitable to become acquirers. Second, zero-revenue firms are more likely to be acquired than other revenue-generating issuers after going public in light of the positive implications that the IPO generates for new entrants in the market for corporate control.

### *2.2 Zero-revenue status and IPO outcomes*

Although motivated by the need to fund superior growth opportunities, the decision to go public may turn out to be inefficient if the issuer's inability to generate revenues until then negatively affects IPO outcomes, possibly by raising the cost of capital for the firm and increasing the risk of delisting. This subsection formulates testable hypotheses about the effect of a firm's absence of revenues on the following outcomes of the going public decision: underpricing, stock liquidity, stock return volatility, and survival.

#### *2.2.1 IPO underpricing*

Information-based theories have played a prominent role in explaining the existence of IPO underpricing and its cross-sectional variation. Starting from the winner's curse theory proposed by Rock (1986), the fact that information about the issuer's true value are not uniformly distributed

across various market participants has been the premise of a number of theoretical explanations. Information revelation (Benveniste and Spindt, 1989) and signaling (Ibbotson, 1975) theories are some of the most notable examples. In presence of a revenue-less issuer, the higher degree of information asymmetry faced by investors should result in higher underpricing than that of ordinary IPOs as a remuneration for investors' superior risk taking. Furthermore, the absence of revenues makes IPO pricing particularly problematic as the most common methodology used to value IPOs, namely comparable firm multiples (Roosenboom, 2012), becomes unfeasible. With future cash flows being difficult to forecast, fair value estimates are affected by a considerable degree of uncertainty. A higher level of uncertainty about the issuer's value also leads to higher expected underpricing (Beatty and Ritter, 1986). Therefore, the above discussed theoretical arguments lead to the hypothesis that IPOs by zero-revenue firms are more underpriced than those by revenue-generating firms.

*2.2.2 Stock liquidity and volatility*

The ability to develop liquid trading in the secondary market is a critical component in the success of an IPO. Liquidity allows to enhance firm value (Silber, 1991) and stimulates trading by knowledgeable investors that make stock prices more informative (Subrahmanyam and Titman, 2001). In terms of information asymmetry, Ellul and Pagano (2006) propose a model in which an issuer's aftermarket liquidity is negatively related to its level of information asymmetry. Diamond and Verrecchia (1991) show that reducing information asymmetry through enhanced disclosure lessens the price impact of trades and improves stock liquidity. If the absence of revenues increases the level of information asymmetry faced by firm outsiders, investors would be discouraged to get involved in trading. This leads to the hypothesis that zero-revenue IPOs are characterized by a lower level of stock liquidity than ordinary IPOs in the aftermarket.

A similar line of reasoning applies for stock return volatility. Uncertainty about whether and when the firm will be able to start generating revenues in the future may increase investors' perceived risk of trading shares of zero-revenue issuers. Furthermore, increased information asymmetry implies

that, in presence of reduced stock liquidity due to lower investor participation, stock prices become a noisier proxy of firm value. As trading activity becomes more sporadic, prices have to adjust to a larger amount of information revealed per trade, and are therefore exposed to higher volatility. Consistently, the effects of periodic surprises about a firm's performance, such as earnings announcements, are amplified in presence of a higher degree of information asymmetry, resulting in more volatile stock returns (Healy et al., 1999). This leads to the hypothesis that zero-revenue IPOs are characterized by a higher level of volatility of stock returns than ordinary IPOs in the aftermarket.

#### *2.2.3 Survival*

Another crucial outcome of the IPO process that has received considerable attention by the literature is the firm's ability to survive in the financial market. The documented determinants of IPO survival are manifold, spanning from the characteristics of the issuing firm (Pour and Lasfer, 2013) to the affiliation with reputable third-party agents like underwriters (Espenlaub et al., 2012) and VCs (Jain and Kini, 2000), to the requirements imposed by stock market regulation (Cattaneo et al., 2015). The prediction generated by the presence of increased information asymmetry argues that zero-revenue IPOs may develop less liquid trading in the aftermarket. A direct implication of this effect is that these IPOs may be less able to attract the amount of trading volume that is necessary to meet ongoing listing requirements, thereby increasing their likelihood of being delisted. Therefore, these arguments lead to the hypothesis that zero-revenue firms are more likely to be delisted than revenue-generating issuers shortly after the IPO.

## 3. Data

### *3.1 Sample*

The empirical design of the paper is based on the population of 2,432 non-financial firms going public in Europe during the period 2002-2014. The stock exchanges of the following countries are

covered: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland, Turkey, and the United Kingdom.[2] The main data source is the EurIPO database, used in previous IPO studies (e.g., Chambers and Dimson, 2009).[3] The population includes IPOs by operating companies identified after applying the usual filters adopted by the IPO literature (e.g., Loughran and Ritter, 2004), i.e. after excluding introductions, readmissions, market transfers, cross-listings, SPACs, and closed-end funds.

Zero-revenue IPOs are defined as initial public offerings by firms that reported zero revenues in the last fiscal year before the IPO date, as stated in the official listing prospectus. Table 1 reports the distribution of zero-revenue IPOs by year, industry, and country. Overall, they account for a significant fraction of the population of European IPOs over the sample period, namely 15%. The year distribution exhibits a certain degree of homogeneity. In terms of industry distribution, the phenomenon is predominant in the natural resources industries, namely oil and gas and mining. This is consistent with previous findings documenting that firms operating in industries characterized by higher capital intensity tend to go public at an earlier stage in their lives (Chemmanur et al., 2010). Given the real options nature of natural resources firms, the absence of revenues may not necessarily due to the inability to bring products to the market. Additional tests in Section 5 address this issue. In terms of country distribution, the highest percentage is in the UK, where one fourth of the IPOs are conducted by firms with no revenues. This is mainly due to the presence of the AIM market.

[ TABLE 1 ]

[2] For France, the French Paris Bourse is considered until the creation of Euronext through the merger of the stock exchanges of Belgium, France, the Netherlands and Portugal, where the first listing took place on January 27, 2005. Afterwards, Euronext is considered in its entirety. The stock exchanges of the four largest European economies (France, Germany, Italy, and UK) are covered over the whole sample period and represent 76.5% of the observations. Other exchanges are covered from 2006 onwards.

[3] See Vismara et al. (2012) for a detailed description of the EurIPO database.

### *3.2 Variables*

Two sets of dependent variables are used in the empirical analysis. The first set is employed to shed light on the two possible motivations pushing zero-revenue firms to go public, namely investments and M&A activity. Investments are proxied by two measures, namely annual capital expenditure and R&D expenses, obtained from Orbis and Datastream. Capital expenditure is defined as the ratio of capital expenditure, i.e. addition to fixed assets other than those associated with acquisitions, to total assets. R&D expenses are also divided by total assets.[4] The two variables are measured by computing the average of the ratios across the three years post-IPO. As for M&A activity, the list of IPOs is matched with Thomson Financial SDC to identify issuers that have been involved in an M&A as acquirer or target within three years of going public. Thus, the variable acquirer equals 1 if the firm has completed an acquisition, while the variable target equals 1 if the firm has been acquired within three years of the IPO.

The second set of dependent variables is aimed at investigating the effect of the zero-revenue status on IPO outcomes, namely (1) IPO underpricing, (2) stock liquidity, (3) stock return volatility, and (4) survival rate. Underpricing is defined as the difference between the first day closing price and the offer price, divided by the offer price. Stock liquidity is measured using three different proxies: bid-ask spread, defined as the average ratio of the difference between bid and ask prices divided by their midpoint; Amihud's (2002) illiquidity ratio, defined as the average ratio of the daily absolute return of a firm's stock to the monetary trading volume on that day; and zero return days, defined as the percentage of trading days in which the closing price is the same as that of the day before. Stock return volatility is defined as the standard deviation of daily stock returns minus the standard deviation

[4] A number of papers measure R&D expenses in terms of R&D-to-sales ratio (e.g., Dambra et al., 2015). The choice of total assets as denominator is motivated by the fact that the R&D-to-sales ratio is impossible to compute for zero-revenue firms. In line with prior literature, R&D expenses are set to zero if missing.

of daily returns of the primary equity index of the stock exchange where the firm goes public, as in Lowry and Murphy (2007). Liquidity and volatility measures are computed from 1 month after the IPO date till the minimum between 13 months after the IPO date and 1 month before any truncation event, such as acquisition or delisting. The first month post-IPO is excluded because the effects of price stabilization by financial intermediaries may influence the results. Finally, survival rate is measured by tracking whether a firm gets delisted for reasons other than takeover within three years of the IPO. The data source of these variables is Datastream. All continuous dependent variables are winsorized at the 1% level.

Among the independent variables, the key explanatory variable of the paper is the zero-revenue dummy, equal to 1 if the issuing firm has reported zero revenues in the last fiscal year before the IPO, according to the official prospectus. The following independent variables are then included in the multivariate analyses as controls. Firm size is defined as the log of the firm's pre-IPO total assets. Firm age is the log of 1 plus the difference between the IPO year and the year the company was founded. Both size and age capture the firm's degree of information asymmetry, which is known to affect various outcomes of the IPO process (e.g., Ellul and Pagano, 2006). Leverage is defined as last fiscal year total debt divided by total assets, and controls for the presence of credit relationships that may reduce the level of uncertainty about the issuer (James and Wier, 1990). Dilution is defined as the number of newly issued shares sold in the IPO divided by the number of pre-IPO shares outstanding, and aims at capturing the owners' attitude towards the listing decision (Habib and Ljungqvist, 2001). VC backing is a dummy equal to 1 if the issuer is backed by a venture capitalist, and controls for the role played by this type of investor in the IPO market (Bessler and Seim, 2012). Underwriter reputation is calculated as the lead underwriter's market share in terms of proceeds raised in European stock exchanges during 1995-2014 (Migliorati and Vismara, 2014), and allows to capture the reputational effect of prestigious investment banks (Beatty and Ritter, 1986). Market momentum is defined as the local equity index return over the 100 trading days before the IPO date, and aims at

controlling for the effects of current market conditions on the IPO decision (Lowry, 2003). Finally, second-tier market is a dummy equal to 1 if the IPO takes place on a second-tier, exchange-regulated market, characterized by looser regulatory requirements than official markets (Vismara et al., 2012).

### *3.3 Methodology*

The behavior of zero-revenue IPOs is investigated in a multivariate setting by means of cross-sectional regressions where the zero-revenue dummy identifies such issuers. To alleviate endogeneity concerns arising from possible selection on observable characteristics, each zero-revenue firm is matched with a revenue-generating firm that (1) goes public in the same calendar year, (2) operates in the same industry (Fama-French 17 classification), and (3) has the closest value of pre-IPO total assets. This allows to ensure a certain degree of comparability between zero-revenue and other IPO firms throughout the analysis. The matching procedure is performed with replacement due to the substantial presence of zero-revenue firms in the mining and oil and gas industries, resulting in a limited number of candidate comparable firms. In these industries, observations in the treatment vs. control groups are 110 vs. 63 and 72 vs. 71, respectively. With the aim of decreasing bias, revenue-generating firms that look similar to more than one zero-revenue firm are therefore employed multiple times. However, no control firm is matched more than five times.

### *3.4 Descriptive statistics*

Table 2 reports descriptive statistics of the sample of IPOs, distinguishing between zero-revenue and other IPOs, with univariate tests on the difference between the two groups. Panel A reports mean and median values of post-IPO investments and M&A variables. On average, capital expenditure by zero-revenue firms over the three years following the listing accounts for 10.8% of total assets, which is slightly higher than the 9.5% associated with revenue-generating IPOs. If we consider median values, however, zero-revenue firms exhibit lower investments, which indicates greater skewness in the capital expenditure distribution of these firms. Post-IPO R&D expenses by zero-revenue firms

account for 5.1% of total assets relative to 3.2% among revenue-generating issuers. The univariate tests document significant differences between R&D expenses of the two groups, with the t-test and the Wilcoxon signed-rank test being significant at the 1% and 10% levels, respectively. As for post-IPO M&A activity, zero-revenue IPOs are less frequently acquired and targeted than ordinary IPOs. In particular, 30% of zero-revenue issuers become acquirers within three years of going public relative to 38.9% of revenue-generating issuers, while 12% is targeted relative to 16%. The z-test for the difference in proportions is significant in both cases.

Panel B shows mean and median values of the IPO outcomes. Zero-revenue IPOs exhibit sensibly higher underpricing than ordinary IPOs (18.2% vs. 11%, on average), with the difference being statistically significant at the 1% level. In the aftermarket, they are associated with a lower level of aftermarket liquidity, as the mean and median values of all the three proxies, namely bid-ask spread, illiquidity ratio, and the fraction of zero return days, are higher than those of other IPOs (a higher value of these variables indicates lower liquidity). Statistical significance of the univariate tests is robust across the three different proxies. Zero-revenue stocks also exhibit a higher degree of volatility, with an average 2.4% standard deviation of daily returns compared to 1.7%. The likelihood of post-IPO delisting is also higher among revenue-less issuers, with 7.8% of them being delisted within three years of going public relative to 4.8% of other issuers.

Concerning firm and offer characteristics, Panel C shows that zero-revenue IPOs are conducted by smaller and younger firms, as expected. Firms going public with no revenues have an average value of total assets of 21 €m and 4.8 years of age, compared to 320.4 €m and 14.8 years of other IPOs. They also tend to be less indebted than firms with prior revenues, with an average 16.2% leverage compared to 33.4%. This is in line with the idea that banks and other financial intermediaries are hesitant to provide private revenue-less firms with access to debt financing. A considerable fraction of zero-revenue issuers, namely 27.9%, are backed by a VC, with this percentage being not statistically different from that associated with revenue-generating issuers. There is, therefore, a

fraction of zero-revenue firms which succeeded in raising VC financing before going public. Additional analyses aimed at testing whether the behavior of VC-backed issuers is different from that of other, non-VC-backed zero-revenue firms are presented in Section 5. The average reputation of IPO underwriters is significantly lower among zero-revenue issuers, since more prestigious banks tend to consider only offerings by large and established firms. Finally, a remarkable difference between the two groups is in the type of market where the offerings take place, with 91.5% of the zero-revenue firms going public on second-tier markets compared to 61.8% of firms with positive revenues. Since these markets are explicitly designed to provide small firms with an easier access to public equity capital by keeping regulatory requirements to a minimal level, they are the preferred destination of zero-revenue firms.

[ TABLE 2 ]

### *3.5 Persistence of the zero-revenue status*

Figure 1 illustrates the post-IPO scenarios faced by zero-revenue firms and allows to assess the persistence of the zero-revenue status beyond the IPO. Starting from the listing date, the graph reports on a quarterly basis the fraction of zero-revenue firms that still lack revenues, those that report positive sales, those targeted in an M&A deal, and those that are delisted within three years of the IPO. At the three-year anniversary, a considerable fraction of zero-revenue firms, namely 18.7%, is still categorized as such. On the other hand, 61.4% are no longer revenue-less at that time. The fraction of firms starting to report revenues persistently increases at a quite stable rate across quarters. The rest of the firms has been either targeted in an acquisition (12%) or delisted (7.8%). The delisting rate among zero-revenue IPOs is higher than the one reported in prior studies on European IPOs in

general (e.g., Gregory et al., 2010), while the frequency of post-IPO takeovers is slightly lower (e.g., Ritter et al., 2013).

[ FIGURE 1 ]

## 4. Empirical tests and results

This section presents the results of the multivariate analyses aimed at testing the predictions of the zero-revenue status on IPO motivations and outcomes. In each table, the behavior of zero-revenue IPOs is benchmarked against that of two different samples, namely the entire population of IPOs and the matched sample of revenue-generating issuers. Standard errors are double clustered by year and country of listing in all regressions.

### *4.1 IPO motivations*

#### *4.1.1 Investments*

The growth opportunities explanation predicts that zero-revenue IPOs are conducted in an attempt to fund value-enhancing projects that would be missed if these firms remained private. If this is the case, then we should observe zero-revenue firms investing more than other firms after the IPO. In particular, given the nature of these firms, investments should largely consist of R&D expenses. The estimates reported in Table 3 test this prediction. In Models 1 and 2, estimates are performed on the entire population of IPOs and on the matched sample, respectively. The dependent variable in both models is the average ratio of capital expenditure to total assets, computed over the first three years post-IPO. In Models 3 and 4, the dependent variable is the average ratio of R&D expenses to total assets, again over the first three years post-IPO.

The evidence in Models 1 and 2 reveals that zero-revenue firms invest significantly less in capex than other firms after going public, both with respect to the full sample and the matched sample of IPOs. In particular, the magnitude of the coefficient of the zero-revenue dummy documents that the average capital expenditure, expressed as a percentage of total assets, is approximately 2.7 points lower than that of ordinary IPOs (2.6 relative to the matched sample). This result seems to contradict the prediction of the growth opportunities hypothesis by showing that zero-revenue firms undertake less investments after going public. However, Models 3 and 4 document that these firms invest significantly more in R&D than other issuers, with a difference of 2.3 percentage points on average (2.4 relative to the matched sample). Thus, zero-revenue firms invest significantly less in capital expenditure and more in R&D than both the rest of the population of IPOs and the sample of revenue-generating peers. This is in line with the predictions of the growth opportunities hypothesis conditioned on the characteristics of zero-revenue firms. Given their small size and young age, the growth opportunities to which these firms allocate IPO proceeds are mostly early-stage investments aimed at speeding products to the market, as typically are R&D projects. Among the control variables, the coefficient of firm size is negatively correlated with both capital expenditure and R&D investments, indicating that the extent of growth opportunities faced by already established firms tends to be smaller.

[ TABLE 3 ]

*4.1.2 M&A activity*

Another possible reason pushing zero-revenue firms to go public is to facilitate their involvement in the market for corporate control. In particular, some of the growth opportunities faced by these firms may be pursued through external acquisitions, although their inability to bring products to the

market before the IPO may decrease this likelihood. Alternatively, the IPO can be used as an intermediate step aimed at removing market inefficiency before selling out to an acquirer. The estimates reported in Table 4 test these predictions (marginal effects are reported). Models 1 and 2 are probit regressions where the dependent variable equals one if the firm has completed an M&A transaction as acquirer within three years of the IPO. In Models 3 and 4, the dependent variable equals one if the firm has been targeted in an M&A transaction during the same time window.

Models 1 and 2 document that zero-revenue firms are significantly less likely to become acquirers shortly after the IPO relative to both the full and the matched samples of IPOs. The marginal effect of the zero-revenue dummy documents a 4.8% lower likelihood relative to the rest of the population of IPOs, and a 11% lower likelihood relative to the control sample of revenue-generating issuers. This documents that zero-revenue firms are less active than other firms as acquirers, which indicates that the benefits associated with going public, such as the possibility to use stock as acquisition currency, do not play a relevant role in their decision. Among the control variables, size and age are both strong predictors of a newly listed firm's propensity to acquire. Also, the issuance of new shares (as proxied by dilution) is associated with a higher likelihood, consistent with the fact that larger IPO proceeds raised by the firm increase its propensity to acquire. Also, VC-backed issuers are more likely to acquire.

Concerning zero-revenue firms' propensity to be targeted post-IPO, Models 3 and 4 document that this likelihood is not statistically different from that of other issuers. Only the evidence in model 4 reports a 3.9% higher likelihood than that of the matched sample, but statistical significance is weak (10% level). Thus, zero-revenue firms are not acquired at a higher rate than other newly listed firms. As for the control variables, the evidence documents that more indebted firms are more likely to be targeted, arguably due to the need of financial support by an incumbent that may help to lower the risk of distress. Dilution is also significant, suggesting that cash-rich firms may be more attractive

towards potential acquirers. Finally, firms going public on second-tier markets are significantly less likely to be acquired.

[ TABLE 4 ]

### *4.2 IPO outcomes*

#### *4.2.1 Underpricing*

Information-based theories of underpricing argue that its magnitude increases with the degree of information asymmetry faced by investors. If the absence of revenues contributes to increase the level of information asymmetry between firm insiders and outsiders, then the shares of zero-revenue issuers should be more underpriced than those of revenue-generating issuers at the IPO. The evidence reported in Table 5 tests this prediction. The coefficient of the zero-revenue dummy is positive and significant both in the full and matched sample estimation, documenting that zero-revenue IPOs exhibit higher underpricing. The magnitude of the coefficients reveals an average difference of approximately 2.3 percentage points in both model specifications. This is consistent with the view that the firm's inability to bring products to the market significantly increases the level of information asymmetry faced by IPO investors, who require a remuneration in the form of underpricing as a compensation for their increased risk taking. From the issuer's perspective, this implies that zero-revenue firms have to leave a larger amount of money on the table.

Among the control variables, underpricing decreases with firm size and age, consistent with an information asymmetry-based explanation, and increases with dilution, consistent with the weak incentive of firm owners to minimize underpricing when they sell very few shares (Habib and Ljungqvist, 2001). Prestigious underwriters are also associated with lower underpricing, in line with

previous European evidence (Migliorati and Vismara, 2014). Predictably, underpricing is higher during hot market periods (e.g., Butler et al., 2014). Although prior studies document differences between main and second-tier markets (Giudici and Roosenboom, 2004), the coefficient of the second-tier market dummy is not significant.

[ TABLE 5 ]

*4.2.2 Stock liquidity*

If the absence of revenues increases the degree of information asymmetry, this should reflect in a lower level of stock liquidity in the aftermarket trading of zero-revenue IPOs relative to revenue-generating issuers. In order to further investigate whether information asymmetry is actually caused by the firm's inability to bring products to the market, firms are split according to the degree of persistence of their revenue-less status. Since liquidity is measured till the minimum between 13 months after the IPO date and 1 month before any truncation event, firms that still lack revenues at the 1-year IPO anniversary are distinguished from those that have generated revenues within one year. If the absence of revenues is what keeps investors away from these stocks, then issuers that are still without revenues after one year, which are identified by the persistent zero-revenue dummy, should exhibit less liquid trading than those that started to generate revenues in the meantime, which are identified by the positive revenues dummy. Table 6 reports the estimates of the regressions on three stock liquidity proxies, namely bid-ask spread (Models 1-4), Amihud's illiquidity ratio (Models 5-8), and the fraction of zero-return days (Models 9-12). The significance levels of the tests of the difference between the coefficients of the persistent zero-revenue and positive revenues dummy variables are also reported at the bottom of the table.

The coefficient of the zero-revenue dummy is positive and significant across all the three liquidity proxies, both in the full and matched sample estimation, documenting that zero-revenue IPOs develop on average less liquid trading than other IPOs in the aftermarket. This is consistent with the effect of increased information asymmetry. The zero-revenue status is associated with lower investor participation in aftermarket trading as investors face a higher risk of being unable to swiftly liquidate their positions in these firms. Furthermore, the coefficients of the persistent zero-revenue and positive revenues variables document that this effect is primarily driven by firms whose revenue-less status is more prolonged after the IPO. The tests on the difference between the two coefficients are always statistically significant, except for the matched sample estimations of the illiquidity and zero-return days models. This provides further support to the view that the inability to generate revenues and the consequent absence of the firm from the product market significantly contributes to increase information asymmetry, leading to less liquid aftermarket trading. This effect becomes more pronounced the more persistent is the firm's inability to bring its products to the market.

The coefficients of the control variables all have the expected signs. In particular, aftermarket liquidity improves with firm size, in presence of reputable third-party agents such as VCs and prestigious underwriters, and during favorable market conditions. On the other hand, second-tier market IPOs develop less liquid trading, in line with prior literature (Gerakos et al., 2013).

[ TABLE 6 ]

*4.2.3 Stock return volatility*

Increased information asymmetry associated with the absence of revenues also predicts a higher degree of volatility in the aftermarket of zero-revenue stocks. The evidence reported in Table 7 addresses this prediction. Again, the sample of zero-revenue issuers is divided between those that

generate revenues within one year of the IPO (positive revenues dummy) and those that do not (persistent zero-revenue). In Models 1 and 3, the coefficients of the zero-revenue dummy are positive and statistically significant. This documents that, on average, zero-revenue firms are associated with a higher level of volatility than both the rest of the population of IPOs and the matched sample of revenue-generating peers. The magnitude of the coefficients reveals a sizeable effect, as the standard deviation of daily stock returns is 30.7% and 21.1% higher, respectively, than that of other IPOs and the matched sample. This evidence provides further support to the prediction generated by the information asymmetry argument, as the absence of revenues is associated not only to less liquid but also more volatile trading. The coefficients of the persistent zero-revenue and positive revenues dummy variables in Models 2 and 4 document that the statistical significance of the aggregate evidence is mainly ascribed to persistent zero-revenue firms.[5] Overall, the combined evidence on stock liquidity and volatility provides support to the view that the zero-revenue status is associated with a higher degree of information asymmetry also following the IPO, thereby exposing zero-revenue issuers to increased liquidity and volatility risk in the aftermarket.

The coefficients of the control variables are coherent with their expected effects on the volatility of stock returns. In particular, the coefficient of firm size is negative and significant, as investments in larger firms tend to have a lower risk profile, and so is the coefficient of the VC backing dummy, in line with the above documented evidence on aftermarket liquidity.

[ TABLE 7 ]

*4.2.4 Survival rate*

[5] Unreported tests document that the difference in magnitude between the two coefficients is not significant.

The presence of increased information asymmetry implies that zero-revenue IPOs are less able to satisfy ongoing listing requirements and therefore face a higher likelihood of being delisted shortly after the IPO than revenue-generating issuers. Table 8 reports estimates of the regressions on the likelihood and the hazard rate of delisting. Models 1-2 are probit regressions on the likelihood of being delisted within three years of the IPO, with the dependent variable being equal to 1 if delisting occurs. Marginal effects are reported. Models 3-4 are Cox proportional hazard models that allow to assess the conditional probability of delisting given that it has not occurred up to the current time (i.e., the hazard rate). The positive (negative) effect of an independent variable is therefore interpreted as an accelerator (decelerator) of the time to delisting and, therefore, increasing (decreasing) its probability.

The marginal effects of the zero-revenue dummy in Models 1 and 2 are positive and significant, documenting that the average delisting rate of zero-revenue IPOs is higher than that of other IPOs. In particular, revenue-less issuers are 3.4% and 3.8% more likely to be delisted relative to the population and the matched sample of IPOs, respectively. Results are confirmed by accounting for the time dimension in the estimation of the hazard ratios in Models 3 and 4, although statistical significance decreases to the 5% level. Overall, the evidence is consistent with the previously documented results on stock liquidity and volatility, which suggest that zero-revenue firms suffer from a larger extent of information asymmetry and develop less liquid and more volatile trading, which contributes to expose them to a higher risk of delisting.

Among the control variables, larger and older issuers are less likely to be delisted in line with prior literature, while the opposite is true for more levered firms, arguably due to the greater risk of financial distress. Second-tier market IPOs are also more likely to be delisted, coherent with Vismara et al. (2012).

[ TABLE 8 ]

## 5. Additional tests

### *5.1 Natural resources firms*

Nearly half of the zero-revenue IPOs are conducted by firms operating in the mining and oil and gas industries. These are typically exploration-stage firms that hold licenses over reserves of natural resources. Since their value exclusively stems from the possibility that extracting and commercializing such resources will become a positive NPV project in the future, these firms acquire the traits of real options. This peculiarity differentiates them from other zero-revenue firms because the absence of revenues does not necessarily reflect their inability to bring products to the market, but indicates that the payoff on extraction has not yet exceeded the costs associated with developing the resource. An example is the IPO by Hurricane Energy, an oil and gas UK-based company gone public in 2014. The company, focused on the exploration and exploitation of fractured basement reservoirs, was holding exploration-stage offshore licenses at the time of the IPO. Its only activity as of the IPO date consisted in exploration drilling and testing. According to the official prospectus, the intended use of proceeds was to fund a new drilling program and other operating and resourcing costs.

In light of this peculiarity, this section replicates the analyses on IPO motivations and outcomes by adding an interaction term that identifies zero-revenue IPOs from the mining and oil and gas industries (according to the Fama-French 17 classification). The coefficient of this variable, labeled as natural resources zero-revenue, indicates whether the behavior of natural resources firms is different from that of other firms within the zero-revenue group. Table 9 reports the coefficients and standard errors of the zero-revenue dummy and of the interaction term for each regression. The dependent variable is reported in the left-hand side of the corresponding row. All regressions have

the same set of control variables employed in the previous models (not reported for brevity), including industry, year, and country fixed effects.

Panel A reports the evidence on post-IPO investments and M&A activity, while Panel B reports the evidence on IPO outcomes. In Panel A, the coefficient of the zero-revenue dummy in the capital expenditure model is not statistically different from zero, as opposed to the full sample estimates where it was negative and significant. The coefficient of the natural resources zero-revenue dummy is instead significant at the 5% level, indicating that the lower investment rate in fixed assets of the average zero-revenue firm documented in the previous analyses is mainly driven by natural resources issuers. In the matched sample estimation, however, the coefficient is no longer significant. The results on R&D expenses also reveal a certain degree of heterogeneity across industries, as natural resources firms invest significantly less, on average, than other zero-revenue firms. The magnitude of the coefficient documents that zero-revenue firms from natural resources industries invest approximately 3.8 percentage points less than other zero-revenue firms (3.7 compared to the matched sample). Overall, the evidence on capital expenditure and R&D indicates that the growth opportunities motivation to go public is less relevant for natural resources firms. Since these firms already hold licenses over reserves of natural resources, IPO proceeds are likely to be used to maintain existing licenses, acquire new ones, and fund operating costs. As for M&A activity, there is no difference between the likelihoods of being acquired and targeted post-IPO of natural resources and other zero-revenue issuers.

In Panel B, the coefficient of the natural resources zero-revenue variable is never significant except in the stock return volatility regression. This indicates that the majority of the IPO outcomes of natural resources issuers, namely underpricing, stock liquidity, and risk of delisting, are not significantly different from those of other zero-revenue firms. However, the higher level of volatility associated with zero-revenue issuers is entirely ascribed to natural resources firms, as the coefficient of the zero-revenue dummy becomes insignificant. The strong dependence of these firms' value on

industry-specific factors, such as the variation in the price of natural resources and the technological advancement in the exploration and extraction processes may explain the higher volatility of their stocks. Also, firms operating in these industries are characterized by high levels of capital intensity and incidence of fixed costs, which contribute to increase their systematic risk.

[ TABLE 9 ]

### *5.2 Venture capital backing*

Among zero-revenue firms that decide to go public, 27.9% have obtained prior VC financing. VCs play an important third-party certification role in the IPO market (Megginson and Weiss, 1991) due to the selection effect associated with their ability to pick promising firms (e.g., Chan, 1983), and the treatment effect associated with the provision of financing and other value-enhancing services during the investment (e.g., Casamatta, 2003). Prior literature has documented that VCs usually take public the most successful firms of their portfolio, and are able to effectively time their exit via IPO (Lerner, 1994). In the context of zero-revenue firms, it is reasonable to expect VCs not to take a revenue-less firm public unless it faces a considerable growth potential. This leads to the prediction that, within zero-revenue firms that decide to go public, those that are backed by a VC may face even greater growth opportunities than other, non-VC backed issuers. Thus, similar to the previous analysis conducted on natural resources firms, this section replicates the analyses on IPO motivations and outcomes by adding an interaction term that identifies zero-revenue IPOs backed by a VC. The coefficient of this variable, labeled as VC-backed zero-revenue, indicates whether the behavior of VC-backed firms is on average different from that of other firms within the zero-revenue group. Table 10 reports the results.

Panel A reports the evidence on post-IPO investments and M&A activity. While the coefficient of the VC-backed zero-revenue variable is not statistically significant in the capital expenditure regressions, it becomes significant at the 1% level when the dependent variable is R&D expenses. In particular, the magnitude of the coefficient indicates that zero-revenue issuers backed by a VC invest on average 1.8 percentage points more in R&D than other zero-revenue firms (2.9 compared to the matched sample) after going public. As for M&A activity, there is no difference in the likelihood of being acquired and targeted post-IPO between VC-backed and non-VC-backed zero-revenue issuers. In Panel B, the coefficient of the VC-backed zero-revenue variable is never significant except for the likelihood of delisting. In this regression, the marginal effect is negative and significant at the 1% level, indicating that zero-revenue issuers backed by a VC face a 6.7% lower likelihood of being delisted relative to zero-revenue issuers that are not backed by a VC (7.3% relative to the matched sample). Overall, the combined evidence of greater R&D investments and lower likelihood of delisting is consistent with the view that VC backing may be a signal of superior firm quality in the context of zero-revenue firms.

[ TABLE 10 ]

## 6. Conclusions

Over the last decade, a significant fraction of companies decided to go public with no revenues. While the increased information asymmetry associated with the absence of track records may undermine the outcomes of such decision, the absence of revenues may indicate the presence of superior growth opportunities in which these firms have been investing. If so, revenue-less issuers may accept larger information production costs in order to raise funds and unlock value-enhancing projects that would otherwise be missed if they remained private. The paper sheds light on the

motivation pushing zero-revenue firms to go public, and investigates whether the inability to bring products to the market until then affects the outcomes of the IPO decision.

The empirical evidence documents that zero-revenue firms go public mainly to invest in R&D projects, which provides support to the growth opportunities explanation and indicates that these opportunities consist of early stage, innovation-oriented investments rather than increases in fixed assets or acquisitions of other firms. This is coherent with their young age and industry distribution. The absence of revenues, however, is found to negatively affect the outcomes of the IPO decision. In particular, zero-revenue issuers leave a larger amount of money on the table at the IPO, and develop less liquid and more volatile trading in the aftermarket. Also, they face a higher risk of delisting. Overall, the paper sheds light on the IPO motivations of zero-revenue firms, which are mainly associated with the need to fund growth opportunities, but highlights the downside risk of this decision, as increased information asymmetry and uncertainty due to the firm's absence from the product market until then raise the cost of raising capital for the firm and the risk of being subsequently delisted.

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**Table 1. Distribution of zero-revenue IPOs.** Number of IPOs and zero-revenue IPOs by year, industry (Fama-French 17 classification), and country of listing.

| | No. | Zero-revenue IPOs | |
|---|---|---|---|
| *Panel A. Year* | IPOs | No. | % |
| 2002 | 98 | 14 | 14.3 |
| 2003 | 76 | 17 | 22.4 |
| 2004 | 251 | 56 | 22.3 |
| 2005 | 338 | 67 | 19.8 |
| 2006 | 434 | 53 | 12.2 |
| 2007 | 409 | 49 | 12.0 |
| 2008 | 85 | 11 | 12.9 |
| 2009 | 22 | 3 | 13.6 |
| 2010 | 115 | 26 | 22.6 |
| 2011 | 120 | 21 | 17.5 |
| 2012 | 91 | 15 | 16.5 |
| 2013 | 135 | 18 | 13.3 |
| 2014 | 258 | 16 | 6.2 |
| *Panel B. Industry* | | | |
| Business & Personal Services | 623 | 43 | 6.9 |
| Computers & Equipment | 241 | 20 | 8.3 |
| Mining | 173 | 110 | 63.6 |
| Oil and Gas | 143 | 72 | 50.3 |
| Construction | 125 | 7 | 5.6 |
| Retail & Consumer Goods | 122 | 6 | 4.9 |
| Pharmaceutical | 104 | 22 | 21.2 |
| Wholesale | 99 | 9 | 9.1 |
| Transportation | 98 | 9 | 9.2 |
| Communication | 79 | 5 | 6.3 |
| Entertainment | 75 | 10 | 13.3 |
| Chemicals | 54 | 10 | 18.5 |
| Other | 496 | 43 | 8.7 |
| *Panel C. Country* | | | |
| United Kingdom | 1,193 | 302 | 25.3 |
| France | 288 | 10 | 3.5 |
| Poland | 182 | 3 | 1.6 |
| Germany | 167 | 6 | 3.6 |
| Italy | 129 | 2 | 1.6 |
| Sweden | 115 | 10 | 8.7 |
| Norway | 91 | 17 | 18.7 |
| Belgium | 51 | 0 | 0.0 |
| Denmark | 35 | 4 | 11.4 |
| Spain | 24 | 0 | 0.0 |
| Other | 157 | 12 | 7.6 |
| Total | 2,432 | 366 | 15.0 |

**Table 2. Descriptive statistics and univariate tests.** Panel A shows post-IPO investment variables, Panel B shows IPO outcome variables, and Panel C shows firm and offer characteristics. In Panel A, *Capital expenditure* is the average ratio of capital expenditure to total assets across the three years post-IPO. *R&D expenses* is the average ratio of R&D expenses (set to zero if missing) to total assets across the three years post-IPO. *Acquirer (target)* is equal to 1 if the firm has completed an M&A as acquirer (target) within three years of the IPO. In Panel B, *Underpricing* is the difference between the first day closing price and the offer price. *Bid-ask spread* is the average ratio of the bid-ask spread divided by the midpoint of the bid and ask prices. *Illiquidity* is the average ratio of the daily absolute return of a firm's stock to the monetary trading volume on that day. *Zero-return days* is the fraction of trading days with zero return. *Stock return volatility* is the standard deviation of daily stock returns minus the standard deviation of the returns of the primary equity index of the stock exchange where the firm goes public. Liquidity and volatility measures are computed from 1 month after the IPO date till the minimum between 13 months after the IPO date and 1 month before any truncation event. *Delisting* is equal to 1 if the firm is delisted for reasons other than takeover within three years of the IPO. In Panel C, *Firm size* is the firm's pre-IPO total assets. *Firm age* is the difference between IPO year and incorporation year. *Leverage* is pre-IPO total debt divided by total assets. *Dilution* is the number of newly issued shares sold in the IPO divided by the number of pre-IPO shares outstanding. *VC backing* equals 1 if the issuer is backed by a VC. *Underwriter reputation* is the lead underwriter's market share in terms of proceeds raised in European stock exchanges during 1995-2014. *Market momentum* is the local equity index return over the 100 trading days before the IPO date. *Second-tier market* equals 1 if the IPO takes place on a second-tier, exchange-regulated market. ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively, of the t-test and Wilcoxon signed-rank test on the difference between the two groups (z-test of difference in proportions in case of binary variables).

| *Panel A. Post-IPO* | Zero-revenue IPOs | | Other IPOs | | Difference | |
|---|---|---|---|---|---|---|
| *investments and M&A* | mean | median | mean | median | Zero rev. - Other | |
| Capital expenditure (%) | 10.8 | 3.5 | 9.5 | 4.7 | 1.3 | -1.2** |
| R&D expenses (%) | 5.1 | 0.0 | 3.2 | 0.0 | 1.9*** | 0.0* |
| Acquirer (%) | 30.0 | 0.0 | 38.9 | 0.0 | -8.9*** | - |
| Target (%) | 12.0 | 0.0 | 16.0 | 0.0 | -4.0* | - |
| *Panel B. IPO outcomes* | | | | | | |
| Underpricing (%) | 18.2 | 10.0 | 11.0 | 6.5 | 7.2*** | 3.5*** |
| Bid-Ask spread (%) | 9.2 | 7.2 | 5.7 | 3.5 | 3.6*** | 3.7*** |
| Illiquidity (%) | 8.5 | 3.9 | 7.1 | 2.8 | 1.3** | 1.1* |
| Zero return days (%) | 60.7 | 66.9 | 42.0 | 36.3 | 18.7*** | 30.7*** |
| Stock return volatility (%) | 2.4 | 2.2 | 1.7 | 1.3 | 0.7*** | 0.9*** |
| Delisting (%) | 7.8 | 0.0 | 4.8 | 0.0 | 3.0** | - |
| *Panel C. Firm and offer characteristics* | | | | | | |
| Firm size (total assets, €m) | 21.0 | 4.2 | 320.4 | 17.0 | -299.4** | -12.8*** |
| Firm age (years at IPO) | 4.8 | 3.0 | 14.8 | 7.0 | -10*** | -4.0*** |
| Leverage (%) | 16.2 | 0.0 | 33.4 | 26.7 | -17.2*** | -26.7*** |
| Dilution (%) | 57.6 | 51.3 | 44.8 | 40.9 | 12.8*** | 10.4*** |
| VC backing (%) | 27.9 | 0.0 | 24.4 | 0.0 | 3.5 | - |
| Underwriter reputation (%) | 0.6 | 0.3 | 1.2 | 0.5 | -0.6*** | -0.2*** |
| Market momentum (%) | 4.7 | 5.9 | 4.8 | 5.8 | -0.2 | 0.2 |
| Second-tier market (%) | 91.5 | 100.0 | 61.8 | 100.0 | 29.8*** | - |

**Table 3. Regressions on post-IPO investments.** OLS regression on capital expenditures (Models 1-2) and R&D expenses (Models 3-4). Capital expenditure is the average ratio of capital expenditure to beginning-of-year total assets across the three years post-IPO. R&D expenses is the average ratio of R&D expenses (set to zero if missing) to beginning-of-year total assets across the three years post-IPO. Firm size is the log of the firm's pre-IPO total assets. Firm age is the log of one plus firm age (in years) at the IPO. Other independent variables are the same as defined in Table 2. Standard errors in brackets are double clustered by country of listing and year. ***, **, and * indicate significance of the coefficients at the 1, 5, and 10 percent levels, respectively.

| | Capital expenditure | | R&D expenses | |
|---|---|---|---|---|
| | Full sample | Matched sample | Full sample | Matched sample |
| | (1) | (2) | (3) | (4) |
| Zero-revenue | -2.694*** | -2.576*** | 2.298*** | 2.388*** |
| | [0.975] | [0.573] | [0.700] | [0.800] |
| Firm size | -0.796*** | -0.247* | -0.471*** | -0.225* |
| | [0.142] | [0.129] | [0.056] | [0.129] |
| Firm age | -0.040 | 1.829* | 0.192* | 0.307 |
| | [0.432] | [0.975] | [0.103] | [0.360] |
| Leverage | 1.920** | 6.243* | -1.172** | -0.904 |
| | [0.757] | [3.538] | [0.498] | [1.977] |
| Dilution | 1.420* | 1.786** | -0.664 | -0.592* |
| | [0.729] | [0.790] | [0.571] | [0.329] |
| VC backing | -0.303 | 0.550 | 0.963* | 1.026 |
| | [0.619] | [0.753] | [0.493] | [0.650] |
| Underwriter reputation | 0.058 | 0.404 | 0.172 | 0.700** |
| | [0.077] | [0.439] | [0.144] | [0.277] |
| Market momentum | 0.906 | -6.574 | 3.952*** | 9.820** |
| | [1.730] | [7.534] | [1.060] | [4.641] |
| Second-tier market | 6.292 | 1.427 | 0.129 | 1.203 |
| | [5.913] | [4.297] | [0.794] | [2.054] |
| Constant | 14.791** | 28.275 | 6.715*** | -4.946 |
| | [6.445] | [18.437] | [2.374] | [9.294] |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Country fixed effects | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes |
| Adjusted R-squared | 0.056 | 0.037 | 0.115 | 0.109 |
| Observations | 2,432 | 732 | 2,432 | 732 |

**Table 4. Regressions on post-IPO M&A activity.** Probit regressions on the likelihood of becoming acquirer (Models 1-2) and target (Models 3-4) in an M&A transaction within three years of the IPO. The dependent variable equals 1 if the firm has completed an M&A as acquirer (target) within three years of the IPO. Marginal effects are reported. Independent variables are the same as defined in Table 3. Standard errors in brackets are double clustered by country of listing and year. ***, **, and * indicate significance of the coefficients at the 1, 5, and 10 percent levels, respectively.

| | Acquirer | | Target | |
|---|---|---|---|---|
| | Full sample | Matched sample | Full sample | Matched sample |
| | (1) | (2) | (3) | (4) |
| Zero-revenue | -0.048*** | -0.110*** | 0.004 | 0.039* |
| | [0.018] | [0.016] | [0.017] | [0.022] |
| Firm size | 0.020*** | 0.023*** | -0.008** | -0.010 |
| | [0.006] | [0.007] | [0.004] | [0.007] |
| Firm age | -0.016*** | -0.042*** | -0.003 | -0.001 |
| | [0.005] | [0.011] | [0.005] | [0.005] |
| Leverage | 0.027 | -0.059 | 0.076*** | 0.097*** |
| | [0.028] | [0.060] | [0.029] | [0.024] |
| Dilution | 0.051*** | 0.070*** | 0.062*** | 0.052* |
| | [0.019] | [0.025] | [0.018] | [0.030] |
| VC backing | 0.067*** | 0.070*** | 0.028** | 0.021* |
| | [0.013] | [0.022] | [0.011] | [0.013] |
| Underwriter reputation | 0.004 | -0.009 | 0.001 | -0.007 |
| | [0.003] | [0.016] | [0.003] | [0.006] |
| Market momentum | 0.256** | 0.112 | 0.008 | -0.033 |
| | [0.103] | [0.132] | [0.121] | [0.115] |
| Second-tier market | -0.136 | 0.196 | -0.084*** | -0.092*** |
| | [0.172] | [0.216] | [0.028] | [0.033] |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Country fixed effects | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes |
| Pseudo R-squared | 0.060 | 0.083 | 0.069 | 0.070 |
| Observations | 2,367 | 720 | 2,367 | 720 |

**Table 5. Regressions on IPO underpricing.** OLS regression with IPO underpricing as dependent variable, defined as the difference between the first day closing price and the offer price divided by the offer price. Independent variables are the same as defined in Table 3. Standard errors in brackets are double clustered by country of listing and year. ***, **, and * indicate significance of the coefficients at the 1, 5, and 10 percent levels, respectively.

| | Full sample | Matched sample |
|---|---|---|
| | (1) | (2) |
| Zero-revenue | 2.279*** | 2.288** |
| | [0.862] | [1.096] |
| Firm size | -1.179*** | -0.770*** |
| | [0.423] | [0.187] |
| Firm age | -0.774*** | -1.647** |
| | [0.287] | [0.816] |
| Leverage | -0.735 | -1.921** |
| | [1.267] | [0.926] |
| Dilution | 3.871*** | 6.604*** |
| | [1.254] | [0.786] |
| VC backing | 0.164 | 1.118 |
| | [1.093] | [2.057] |
| Underwriter reputation | -1.389*** | -2.755*** |
| | [0.286] | [0.415] |
| Market momentum | 18.719*** | 18.536* |
| | [6.621] | [10.409] |
| Second-tier market | 3.057 | 4.731 |
| | [2.767] | [4.860] |
| Constant | 29.002* | 12.807*** |
| | [14.917] | [4.388] |
| Year fixed effects | Yes | Yes |
| Country fixed effects | Yes | Yes |
| Industry fixed effects | Yes | Yes |
| Adjusted R-squared | 0.132 | 0.113 |
| Observations | 2,432 | 732 |

**Table 6. Regressions on stock liquidity.** Regressions with Bid-ask spread (Models 1-2), illiquidity ratio (Models 3-4), and zero-return days (Models 5-6) as dependent variables. Bid-ask spread is the average ratio of the bid-ask spread divided by the midpoint of the bid and ask prices. Illiquidity is the average ratio of the daily absolute return of a firm's stock to the monetary trading volume on that day. Zero-return days is the fraction of trading days with zero return. All dependent variables are measured from 1 month after the IPO date till the minimum between 13 months after the IPO date and 1 month before any truncation event. Persistent zero-revenue equals 1 if the firm is still revenue-less at the one-year IPO anniversary. Positive revenues equals 1 if the firm has generated revenues within one year of the IPO. 'Diff. persistent-positive' reports the significance of the test of the difference between the two coefficients. Other independent variables are the same as defined in Table 3. Standard errors in brackets are double clustered by country of listing and year. ***, **, and * indicate significance of the coefficients at the 1, 5, and 10 percent levels, respectively.

| | Bid-Ask spread | | | | Illiquidity ratio | | | | Zero-return days | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Full sample | | Matched sample | | Full sample | | Matched sample | | Full sample | | Matched sample | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Zero-revenue | 0.936*** | | 1.639*** | | 2.190** | | 2.875** | | 1.397*** | | 2.010** | |
| | [0.308] | | [0.390] | | [0.864] | | [1.196] | | [0.332] | | [0.964] | |
| Persistent zero-revenue | | 1.509*** | | 2.084*** | | 2.277*** | | 2.774*** | | 2.397** | | 2.132* |
| | | [0.427] | | [0.736] | | [0.742] | | [0.891] | | [0.922] | | [1.138] |
| Positive revenues | | 0.298 | | 0.097 | | 1.939 | | 3.190 | | -0.491 | | 1.630* |
| | | [0.788] | | [0.791] | | [1.392] | | [2.131] | | [0.430] | | [0.862] |
| Firm size | -0.714*** | -0.722*** | -0.696*** | -0.704*** | -0.422 | -0.428 | -0.272 | -0.272 | -2.301*** | -2.327*** | -1.885*** | -1.907*** |
| | [0.144] | [0.142] | [0.166] | [0.164] | [0.322] | [0.321] | [0.209] | [0.209] | [0.071] | [0.081] | [0.325] | [0.321] |
| Firm age | -0.226* | -0.226* | -0.111 | -0.105 | 0.475 | 0.475 | 0.625* | 0.625* | -0.237 | -0.236 | -0.292 | -0.279 |
| | [0.133] | [0.130] | [0.128] | [0.116] | [0.302] | [0.302] | [0.354] | [0.354] | [0.274] | [0.272] | [0.323] | [0.318] |
| Leverage | 0.248 | 0.357 | 0.047 | 0.261 | 1.811 | 1.863 | 2.006** | 1.997** | 2.701* | 2.949* | 2.317 | 2.655 |
| | [0.738] | [0.692] | [1.097] | [1.029] | [1.379] | [1.379] | [0.846] | [0.875] | [1.538] | [1.640] | [1.590] | [1.611] |
| Dilution | -0.703 | -0.671 | -0.105 | -0.095 | -0.604 | -0.595 | -0.414 | -0.412 | 0.405 | 0.447 | 0.590* | 0.576 |
| | [0.810] | [0.791] | [0.929] | [0.915] | [0.757] | [0.747] | [1.202] | [1.201] | [0.450] | [0.345] | [0.347] | [0.377] |
| VC backing | -0.206 | -0.188 | -0.105 | -0.045 | -3.173*** | -3.158*** | -3.779*** | -3.783*** | -0.792 | -0.722 | 0.779 | 0.954 |
| | [0.190] | [0.188] | [0.086] | [0.097] | [0.361] | [0.350] | [0.616] | [0.604] | [1.090] | [1.026] | [1.180] | [1.127] |
| Underwriter reputation | -0.183*** | -0.177*** | -0.161** | -0.152* | -0.343*** | -0.339*** | -0.630*** | -0.631*** | -1.739*** | -1.722*** | -1.690*** | -1.664*** |
| | [0.050] | [0.054] | [0.067] | [0.078] | [0.075] | [0.075] | [0.122] | [0.121] | [0.169] | [0.184] | [0.055] | [0.104] |
| Market momentum | -8.580*** | -8.684*** | -4.138 | -4.441 | -10.748*** | -10.795*** | -12.520*** | -12.507*** | -26.148*** | -26.369*** | -21.573** | -22.068** |
| | [3.121] | [3.087] | [3.469] | [3.359] | [3.069] | [3.039] | [3.122] | [3.136] | [3.890] | [3.880] | [8.890] | [8.899] |
| Second-tier market | 3.045*** | 3.027*** | 3.013*** | 3.003*** | 2.019* | 2.014* | 2.152* | 1.951 | 20.363*** | 20.337*** | 20.328*** | 20.355*** |
| | [0.331] | [0.330] | [0.407] | [0.389] | [1.209] | [1.210] | [1.141] | [1.541] | [1.794] | [1.803] | [1.284] | [1.323] |
| Constant | 17.175*** | 17.270*** | 16.010*** | 16.043*** | 9.647 | 9.720 | 15.417*** | 15.411*** | 82.122*** | 82.541*** | 93.274*** | 103.404*** |
| | [2.635] | [2.585] | [3.178] | [3.109] | [15.317] | [15.323] | [3.964] | [3.242] | [26.679] | [26.640] | [4.655] | [4.543] |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Diff. persistent-positive | | *** | | *** | | ** | | | | ** | | |
| Adjusted R-squared | 0.236 | 0.241 | 0.222 | 0.234 | 0.158 | 0.156 | 0.148 | 0.147 | 0.543 | 0.545 | 0.489 | 0.490 |
| Observations | 2,432 | 2,432 | 732 | 732 | 2,432 | 2,432 | 732 | 732 | 2,432 | 2,432 | 732 | 732 |

**Table 7. Regressions on stock return volatility.** OLS regressions with stock return volatility as dependent variable, defined as the standard deviation of daily stock returns minus the standard deviation of the returns of the primary equity index of the stock exchange where the firm goes public, computed from 1 month after the IPO date till the minimum between 13 months after the IPO date and 1 month before any truncation event. Persistent zero-revenue equals 1 if the firm is still revenue-less at the one-year IPO anniversary. Positive revenues equals 1 if the firm has generated revenues within one year of the IPO. Other independent variables are the same as defined in Table 3. Standard errors in brackets are double clustered by country of listing and year. ***, **, and * indicate significance of the coefficients at the 1, 5, and 10 percent levels, respectively.

| | Full sample | | Matched sample | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Zero-revenue | 0.307*** | | 0.211** | |
| | [0.053] | | [0.090] | |
| Persistent zero-revenue | | 0.307*** | | 0.197* |
| | | [0.051] | | [0.113] |
| Positive revenues | | 0.307* | | 0.258 |
| | | [0.164] | | [0.166] |
| Firm size | -0.135*** | -0.136*** | -0.207*** | -0.215*** |
| | [0.031] | [0.031] | [0.068] | [0.065] |
| Firm age | -0.012 | -0.012 | 0.014 | 0.009 |
| | [0.063] | [0.063] | [0.039] | [0.040] |
| Leverage | -0.166* | -0.151 | -0.318 | -0.248 |
| | [0.098] | [0.095] | [0.291] | [0.284] |
| Dilution | -0.157* | -0.154* | -0.130 | -0.124 |
| | [0.088] | [0.083] | [0.278] | [0.273] |
| VC backing | -0.215*** | -0.212*** | -0.422*** | -0.417*** |
| | [0.076] | [0.076] | [0.148] | [0.148] |
| Underwriter reputation | 0.011 | 0.012 | -0.107* | -0.096 |
| | [0.015] | [0.014] | [0.061] | [0.061] |
| Market momentum | -0.223 | -0.237 | -2.084** | -2.083** |
| | [0.525] | [0.514] | [0.815] | [0.813] |
| Second-tier market | 0.294 | 0.292 | -0.052 | -0.050 |
| | [0.445] | [0.445] | [0.352] | [0.353] |
| Constant | 4.958*** | 4.973*** | 2.461** | 2.574** |
| | [0.684] | [0.675] | [1.095] | [1.102] |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Country fixed effects | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes |
| Adjusted R-squared | 0.121 | 0.120 | 0.097 | 0.090 |
| Observations | 2,432 | 2,432 | 732 | 732 |

**Table 8. Regressions on the likelihood of being delisted.** Probit regressions (Models 1-2) and Cox proportional hazard models (Models 3-4) on the likelihood of being delisted within three years of the IPO. Independent variables are the same as defined in Table 3. Marginal effects are reported in Models 1-2, hazard rates in Models 3-4. Standard errors in brackets are double clustered by country of listing and year. ***, **, and * indicate significance of the coefficients at the 1, 5, and 10 percent levels, respectively.

| | Likelihood of delisting | | Hazard rate of delisting | |
|---|---|---|---|---|
| | Full sample | Matched sample | Full sample | Matched sample |
| | (1) | (2) | (3) | (4) |
| Zero-revenue | 0.034*** | 0.038*** | 0.184** | 0.129** |
| | [0.006] | [0.008] | [0.087] | [0.064] |
| Firm size | -0.003** | -0.002 | -0.040** | -0.066** |
| | [0.001] | [0.002] | [0.019] | [0.027] |
| Firm age | -0.006** | -0.003* | -0.144*** | -0.136*** |
| | [0.002] | [0.002] | [0.030] | [0.036] |
| Leverage | 0.017** | 0.022* | 0.345*** | 0.183* |
| | [0.009] | [0.013] | [0.099] | [0.108] |
| Dilution | 0.003 | -0.004 | 0.139 | 0.152* |
| | [0.011] | [0.007] | [0.119] | [0.078] |
| VC backing | -0.003 | -0.001 | 0.148* | 0.148 |
| | [0.010] | [0.010] | [0.080] | [0.142] |
| Underwriter reputation | -0.004* | -0.020** | -0.013 | 0.000 |
| | [0.002] | [0.009] | [0.029] | [0.048] |
| Market momentum | -0.049** | 0.014 | 0.236 | 0.027 |
| | [0.023] | [0.058] | [0.469] | [0.486] |
| Second-tier market | 0.058** | 0.040* | 0.521*** | 0.512** |
| | [0.027] | [0.022] | [0.153] | [0.236] |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Country fixed effects | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes |
| Pseudo R-squared | 0.071 | 0.094 | 0.056 | 0.058 |
| Observations | 2,367 | 720 | 2,432 | 732 |

**Table 9. Zero-revenue IPOs in the natural resources industry.** The table reports the coefficients and standard errors of the zero-revenue dummy and of its interaction with the natural resources dummy in each of the regressions with the dependent variables reported in rows. All regressions have the same set of control variables employed in the previous models (not reported for brevity), including industry, year, and country fixed effects. Marginal effects are reported in the acquirer, target, and delisting models. Standard errors in brackets are double clustered by country of listing and year. ***, **, and * indicate significance of the coefficients at the 1, 5, and 10 percent levels, respectively.

| *Panel A. Post-IPO investments and M&A* | | Coefficient estimates | |
|---|---|---|---|
| Dep var | Explanatory variable | Full sample | Matched sample |
| Capital expenditure | Zero-revenue | -0.977 | -1.564 |
| | | [0.838] | [1.603] |
| | Natural resources zero-revenue | -4.670** | -1.861 |
| | | [1.804] | [2.017] |
| R&D expenses | Zero-revenue | 3.422*** | 4.272*** |
| | | [0.948] | [0.877] |
| | Natural resources zero-revenue | -3.382*** | -3.704*** |
| | | [1.154] | [0.410] |
| Acquirer | Zero-revenue | -0.045** | -0.097** |
| | | [0.018] | [0.046] |
| | Natural resources zero-revenue | -0.008 | -0.027 |
| | | [0.023] | [0.093] |
| Target | Zero-revenue | 0.003 | 0.053** |
| | | [0.025] | [0.022] |
| | Natural resources zero-revenue | 0.003 | -0.026 |
| | | [0.040] | [0.048] |
| *Panel B. Post-IPO outcomes* | | | |
| Underpricing | Zero-revenue | 3.396** | 4.987* |
| | | [1.474] | [2.757] |
| | Natural resources zero-revenue | -3.362 | -5.188 |
| | | [2.293] | [4.133] |
| Bid-ask spread | Zero-revenue | 0.852* | 2.097* |
| | | [0.484] | [1.263] |
| | Natural resources zero-revenue | 0.165 | -0.618 |
| | | [0.226] | [1.528] |
| Illiquidity ratio | Zero-revenue | 2.653*** | 3.889*** |
| | | [0.836] | [1.255] |
| | Natural resources zero-revenue | -1.396 | -1.696* |
| | | [1.179] | [0.988] |
| Zero-return days | Zero-revenue | 3.022** | 6.602*** |
| | | [1.119] | [1.766] |
| | Natural resources zero-revenue | -4.905*** | -8.031*** |
| | | [1.400] | [1.847] |
| Stock return volatility | Zero-revenue | -0.166 | -0.224 |
| | | [0.152] | [0.177] |
| | Natural resources zero-revenue | 0.946*** | 0.841*** |
| | | [0.222] | [0.240] |
| Delisting | Zero-revenue | 0.035*** | 0.045*** |
| | | [0.008] | [0.014] |
| | Natural resources zero-revenue | -0.005 | -0.018 |
| | | [0.013] | [0.020] |

**Table 10. VC-backed zero-revenue IPOs.** The table reports the coefficients and standard errors of the zero-revenue dummy and of its interaction with the VC backing dummy in each of the regressions with the dependent variables reported in rows. All regressions have the same set of control variables employed in the previous models (not reported for brevity), including industry, year, and country fixed effects. Marginal effects are reported in the acquirer, target, and delisting models. Standard errors in brackets are double clustered by country of listing and year. ***, **, and * indicate significance of the coefficients at the 1, 5, and 10 percent levels, respectively.

| *Panel A. Post-IPO investments and M&A* | | Coefficient estimates | |
|---|---|---|---|
| Dep var | Explanatory variable | Full sample | Matched sample |
| Capital expenditure | Zero-revenue | -2.189* | -1.951* |
| | | [1.301] | [1.136] |
| | VC-backed zero-revenue | -1.737 | -2.349 |
| | | [1.231] | [1.684] |
| R&D expenses | Zero-revenue | 1.818** | 1.624** |
| | | [0.716] | [0.710] |
| | VC-backed zero-revenue | 1.778*** | 2.854*** |
| | | [0.171] | [0.175] |
| Acquirer | Zero-revenue | -0.063*** | -0.151*** |
| | | [0.016] | [0.040] |
| | VC-backed zero-revenue | 0.054 | 0.154 |
| | | [0.039] | [0.102] |
| Target | Zero-revenue | 0.021 | 0.041** |
| | | [0.018] | [0.017] |
| | VC-backed zero-revenue | -0.037* | -0.009 |
| | | [0.021] | [0.017] |
| *Panel B. Post-IPO outcomes* | | | |
| Underpricing | Zero-revenue | 1.747*** | 3.153** |
| | | [0.516] | [1.442] |
| | VC-backed zero-revenue | 1.961 | 0.326 |
| | | [1.816] | [0.942] |
| Bid-ask spread | Zero-revenue | 0.857** | 1.404*** |
| | | [0.385] | [0.454] |
| | VC-backed zero-revenue | 0.287 | 0.966 |
| | | [0.794] | [1.091] |
| Illiquidity ratio | Zero-revenue | 2.417*** | 3.518*** |
| | | [0.825] | [1.284] |
| | VC-backed zero-revenue | -0.840 | -3.001*** |
| | | [0.844] | [0.837] |
| Zero-return days | Zero-revenue | 1.503*** | 2.948 |
| | | [0.156] | [1.824] |
| | VC-backed zero-revenue | -0.391 | -4.380* |
| | | [1.344] | [2.355] |
| Stock return volatility | Zero-revenue | 0.300*** | 0.301** |
| | | [0.100] | [0.133] |
| | VC-backed zero-revenue | 0.024 | -0.042 |
| | | [0.147] | [0.065] |
| Delisting | Zero-revenue | 0.048*** | 0.048*** |
| | | [0.007] | [0.009] |
| | VC-backed zero-revenue | -0.067** | -0.073*** |
| | | [0.033] | [0.017] |

**Figure 1. Evolution of zero-revenue firms over the first three years post-IPO.** Quarterly distribution of zero-revenue firms across the four possible scenarios up to three years after the IPO. At the IPO, zero-revenue firms represent 100%. From quarter 1 onwards, a zero-revenue firm can be categorized as: still zero-revenue (white), positive revenues (light grey), acquired by another firm (dark grey), or delisted (black).